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### (54) WRITING METHOD AND READER-WRITER FOR IC CARD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an IC card reader-writer which can stably write data to an IC card.

SOLUTION: This reader-writer has a reception level decision means 6 which decides whether data transmission to the IC card 10 is allowed by comparing the receive signal level of a radio wave received by a receiving means 5 from the IC card 10 with a specific value previously set in a reception level storage means 7 and a transmitting means 3 which sends data to be written to the IC card 10 with the radio wave only when the reception level decision means 6 allows the data transmission.

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### CLAIMS

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[Claim(s)]

[Claim 1] When writing in by transmitting data to an IC card by a radio wave a received signal level of a radio wave which received from said IC card is compared with a predetermined value memorized beforehand An IC card write-in method of transmitting data which should be written in said IC card only when a received signal level of said radio wave which received is higher than said predetermined value.

[Claim 2] The minimum value of a received signal level of a radio wave which received from an IC card is memorized When writing in by transmitting data to said IC card by a

radio waveAn IC card write-in method of transmitting data which should write a received signal level of a radio wave which received from said IC card in said IC card as compared with regulation twice of said minimum value only when there is a received signal level of said radio wave which received more than regulation double [ of said minimum value ].

[Claim 3]IC card reader writers comprising:

A reception means which receives a radio wave from an IC card.

A receiving level memory measure which memorizes a predetermined value.

A receiving level judging means which judges whether data transmission to said IC card is permitted comparing with said predetermined value a received signal level of a radio wave which received from said IC card.

A transmitting means which transmits data which should be written in said IC card by a radio wave only when said receiving level judging means permits data transmission.

[Claim 4]IC card reader writers comprising:

A reception means which receives a radio wave from an IC card.

A receiving level memory measure which memorizes the minimum value of a received signal level of a radio wave which received from said IC card.

A receiving level judging means which judges whether data transmission to said IC card is permitted comparing with regulation twice of said minimum value a received signal level of a radio wave which received from said IC card.

A transmitting means which transmits data which should be written in said IC card by a radio wave only when said receiving level judging means permits transmission of data.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the IC card reader writers which write by a radio wave to a noncontact IC card.

[0002]

[Description of the Prior Art]ConventionallyIC card reader writers send out a radio wave to a regulation range scaleand direct the writing of dataand reading of data by a radio wave to the IC card which exists within the limits of it. An IC card uses as a power supply electric power of the radio wave which received from IC card reader writersThe data which was received by the radio wave from IC card reader writers in writing is written in an internal memoryandin readingthe data memorized by the internal memory is transmitted by a radio wave at IC card reader writers.

[0003]

[Problem(s) to be Solved by the Invention]However, in such conventional IC card reader writers, by the case where an IC card writes data in an internal memory and the case where an IC card reads data in an internal memory. Since the direction where an IC card writes data in an internal memory generally needs more electric power. Even if it was a case where it existed in the regulation range scale where an IC card can communicate in the position whose distance from IC card reader writers is comparatively far, there was a problem that the writing of data may become unstable at the time of the writing of data.

[0004] This invention was made in order to solve such a problem and it provides the IC card reader writers which are stabilized in an IC card and can write in data.

[0005]

[Means for Solving the Problem] When writing in by an IC card write-in method of this invention transmitting data to an IC card by a radio wave. As compared with a predetermined value which memorized beforehand, a received signal level of a radio wave which received from said IC card only when a received signal level of said radio wave which received is higher than said predetermined value, it has the composition which transmits data which should be written in said IC card. By this composition, it will be stabilized in an IC card and data can be written in.

[0006] An IC card write-in method of this invention memorizes the minimum value of a received signal level of a radio wave which received from an IC card. When writing in by transmitting data to said IC card by a radio wave, it has the composition which transmits data which should write a received signal level of a radio wave which received from said IC card in said IC card only when there is a received signal level of said radio wave which received more than regulation double [ of said minimum value ] as compared with regulation twice of said minimum value. By this composition, it will be stabilized in an IC card and data can be written in. A reference value used for a judgment at the time of writing in an IC card can be automatically set up according to conditions of the characteristic of IC card reader writers and an IC card.

[0007] A reception means in which IC card reader writers of this invention receive a radio wave from an IC card. A receiving level memory measure which memorizes a predetermined value and a receiving level judging means which judges whether data transmission to said IC card is permitted comparing with said predetermined value a received signal level of a radio wave which received from said IC card. Only when said receiving level judging means permits data transmission, it has the composition provided with a transmitting means which transmits data which should be written in said IC card by a radio wave. By this composition, it will be stabilized in an IC card and data can be written in.

[0008] A reception means in which IC card reader writers of this invention receive a radio wave from an IC card. A receiving level memory measure which memorizes the minimum value of a received signal level of a radio wave which received from said IC

cardA receiving level judging means which judges whether data transmission to said IC card is permitted comparing with regulation twice of said minimum value a received signal level of a radio wave which received from said IC cardOnly when said receiving level judging means permits transmission of datait has the composition provided with a transmitting means which transmits data which should be written in said IC card by a radio wave. By this compositionit will be stabilized in an IC card and data can be written in. A reference value used for a judgment at the time of writing in an IC card can be automatically set up according to conditions of the characteristic of IC card reader writers and an IC card.

[0009]

[Embodiment of the Invention]Hereafteran embodiment of the invention is described using a drawing.[0010](A 1st embodiment) Drawing 1 shows the composition of the IC card reader writers (henceforth a reader writer) in this embodiment. The reader writer 1 is provided with the following in drawing 1.

Control means 2.

The transmitting means 3 which transmits a radio wave to IC card 10.

Antenna 4.

It is judged whether based on the received signal level of the reception means 5 which receives a radio waveand the radio wave which received from the IC cardthe data transmission to IC card 10 is permitted from IC card 10 (.). Namelythe receiving level memory measure 7 which memorizes the predetermined value of the received signal level which judges whether the data transmission to an IC card is permitted to be the receiving level judging means 6 which judges whether data is written in an IC card.

IC card 10 has a memory which memorizes the data received from the reader writer 1 inside.

[0011]The control means 2 gives directions suitably to the transmitting means 3 based on the state of reader writer 1 insideand the existence of IC card 10. The transmitting means 3 transmits a command and the data which should be written in by a radio wave to IC card 10 via the antenna 4 according to the directions from the control means 2. If the data which should be written in is receivedIC card 10 will write the received data in an internal memoryand will transmit a response to the reader writer 1. If a reading command is receivedIC card 10 will read data in an internal memoryand will transmit data to the reader writer 1. The reception means 5 receives the data from IC card 10 by a radio wave via the antenna 4.

[0012]The control means 2 directs transmission of a polling command to the transmitting means 3 in order to recognize existence of IC card 10. The transmitting means 3 transmits a polling command by a radio wave to IC card 10 via the antenna 4. IC card 10 returns the response which tells existence corresponding to a polling command to the reader writer 1when located within limits which can communicate. The reception means 5 receives the response to the polling command from IC card 10

by a radio wave via the antenna 4.

[0013]The receiving level judging means 6 compares the received signal level of the radio wave which received from IC card 10 with the predetermined value beforehand set as the receiving level memory measure 7 (memory)When the received signal level of the radio wave which received from IC card 10 is higher than the predetermined value set up beforehandIC card 10 is comparatively located in the neighborhood from the reader writer 1and it judges with the ability of sufficient electric power for IC card 10 to write data in an internal memory to be supplied. That isit judges with the receiving level judging means 6 permitting the data transmission to IC card 10the control means 2 performs processing of data readingand processing of data writing if neededand the transmitting means 3 transmits the data which should be written in IC card 10 by a radio wave.

[0014]When the receiving level judging means 6 does not have a received signal level of the radio wave which received from IC card 10 higher than the predetermined value set up beforehandIt judges with the ability of sufficient electric power for the position of IC card 10 to write in a long distance from the reader writer 1and for IC card 10 write data in an internal memory not to be supplied. That isit judges with the receiving level judging means 6 forbidding the data transmission to IC card 10and henceforththe control means 2 performs only processing of data reading to IC card 10and does not perform processing of data writing.

[0015]According to this embodimentthe receiving level judging means 6 and the receiving level memory measure 7 are established as mentioned aboveWhen writing in by transmitting data to IC card 10 by a radio waveThe received signal level of the radio wave which received from IC card 10 is compared with the predetermined value memorized beforehandSince the data which should be written in IC card 10 is transmitted only when the received signal level of the radio wave which received is higher than a predetermined valueit will be stabilized in IC card 10 and data can be written in.

[0016](A 2nd embodiment) Drawing 1 shows the composition of the IC card reader writers (henceforth a reader writer) in this embodiment. Only the constituent features from which a 1st embodiment and operation differ are explained hereafterand explanation is omitted about the constituent features with the same operation.

[0017]The control means 2 directs first reading of the data memorized by predetermined memory block in the memory inside IC card 10 to the transmitting means 3when writing in data to IC card 10. The transmitting means 3 transmits the reading command of the directed contents to IC card 10. IC card 10 returns the data memorized by directed memory block to the reader writer 1. The reception means 5 receives the data from IC card 10 by a radio wave via the antenna 4.

[0018]The receiving level judging means 6 compares the received signal level of the radio wave which received from IC card 10 with the predetermined value beforehand set as the receiving level memory measure 7 (memory)When the received signal level

of the radio wave which received from IC card 10 is higher than the predetermined value set up beforehand IC card 10 is comparatively located in the neighborhood from the reader writer 1 and it judges with the ability of sufficient electric power for IC card 10 to write data in an internal memory to be supplied. That is it judges with the receiving level judging means 6 permitting the data transmission to IC card 10 the control means 2 processes writing and the transmitting means 3 transmits the data which should be written in IC card 10 by a radio wave.

[0019] When the receiving level judging means 6 does not have a received signal level of the radio wave which received from IC card 10 higher than the predetermined value set up beforehand it judges with the ability of sufficient electric power for the position of IC card 10 to write in a long distance from the reader writer 1 and for IC card 10 write data in an internal memory not to be supplied. Namely judge with the receiving level judging means 6 forbidding the data transmission to IC card 10 and henceforth the control means 2 When processing of the writing of data is suspended and the received signal level from IC card 10 exceeds a predetermined value until the received signal level from IC card 10 exceeds a predetermined value processing of the writing of data to IC card 10 is continued.

[0020] As mentioned above since according to this embodiment the data of an IC card is certainly read and the level of an input signal is judged just before the writing of the data to IC card 10 The situation of the present IC card will be checked and the stable data to IC card 10 can always be written in.

[0021] (A 3rd embodiment) Drawing 2 shows the composition of the IC card reader writers (henceforth a reader writer) in this embodiment. The reader writer 9 is provided with the following in drawing 2.

Control means 2.

The transmitting means 3 which transmits a radio wave to IC card 10.

Antenna 4.

It is judged whether based on the received signal level of the reception means 5 which receives a radio wave and the radio wave which received from the IC card the data transmission to IC card 10 is permitted from IC card 10 (.). Namely the receiving level judging means 6 which judges whether data is written in an IC card the receiving level memory measure 7 which memorizes the minimum value of the received signal level of the radio wave which received from the IC card and an A/D conversion means 8 to perform analog-to-digital conversion.

[0022] The control means 2 gives directions suitably to the transmitting means 3 based on the state of reader writer 9 inside and the existence of IC card 10. The transmitting means 3 transmits a command and the data which should be written in by a radio wave to IC card 10 via the antenna 4 according to the directions from the control means 2. If the data which should be written in is received IC card 10 will write the received data in an internal memory and will transmit a response to the reader

writer 9. If a reading command is received IC card 10 will read data in an internal memory and will transmit data to the reader writer 9. The reception means 5 receives the data from IC card 10 by a radio wave via the antenna 4.

[0023] The control means 2 directs transmission of a polling command to the transmitting means 3 in order to recognize existence of IC card 10. The transmitting means 3 transmits a polling command by a radio wave to IC card 10 via the antenna 4. IC card 10 returns the response which tells existence corresponding to a polling command to the reader writer 9 when located within limits which can communicate. The reception means 5 receives the response to the polling command from IC card 10 by a radio wave via the antenna 4. The A/D conversion means 8 performs analog-to-digital conversion to an input signal. The receiving level memory measure 7 memorizes the minimum value of the received signal level of the radio wave which received from IC card 10 after powering on about the numerical value by which analog-to-digital conversion was carried out.

[0024] The receiving level judging means 6 compares the received signal level of the radio wave which received from IC card 10 with the minimum value set as the receiving level memory measure 7 (memory). When there is a received signal level of the radio wave which received from IC card 10 more than regulation double [ of the minimum value ] IC card 10 is comparatively located in the neighborhood from the reader writer 9 and it is judged that sufficient electric power for IC card 10 to write data in an internal memory can be supplied. That is it judges with the receiving level judging means 6 permitting the data transmission to IC card 10 the control means 2 performs processing of data reading and processing of data writing if needed and the transmitting means 3 transmits the data which should be written in IC card 10 by a radio wave.

[0025] It judges with the ability of the receiving level judging means 6 not to supply electric power sufficient when there is no received signal level of the radio wave which received from IC card 10 more than regulation double [ of the minimum value ] for the position of IC card 10 to write in a long distance from the reader writer 9 and for IC card 10 write data in an internal memory. That is it judges with the receiving level judging means 6 forbidding the data transmission to IC card 10 and henceforth the control means 2 performs only processing of data reading to IC card 10 and does not perform processing of data writing.

[0026] According to this embodiment the receiving level judging means 6 and the receiving level memory measure 7 are established as mentioned above. The minimum value of the received signal level of the radio wave which received from IC card 10 is memorized. When writing in by transmitting data to IC card 10 by a radio wave the received signal level of the radio wave which received from IC card 10 is compared with the regulation twice of the minimum value. Since the data which should be written in IC card 10 is transmitted only when there is a received signal level of the radio wave which received more than regulation double [ of the minimum value ] it will be

stabilized in IC card 10 and data can be written in.

[0027]

[Effect of the Invention] This invention can provide the IC card reader writers which have the outstanding effect that it is stabilized in an IC card and data can be written in.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] The block diagram of the IC card reader writers in a 1st embodiment and a 2nd embodiment

[Drawing 2] The block diagram of the IC card reader writers in a 3rd embodiment

[Description of Notations]

19 IC card reader writers

2 Control means

3 Transmitting means

4 Antenna

5 Reception means

6 Receiving level judging means

7 Receiving level memory measure

8 A/D conversion means

10 IC card

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